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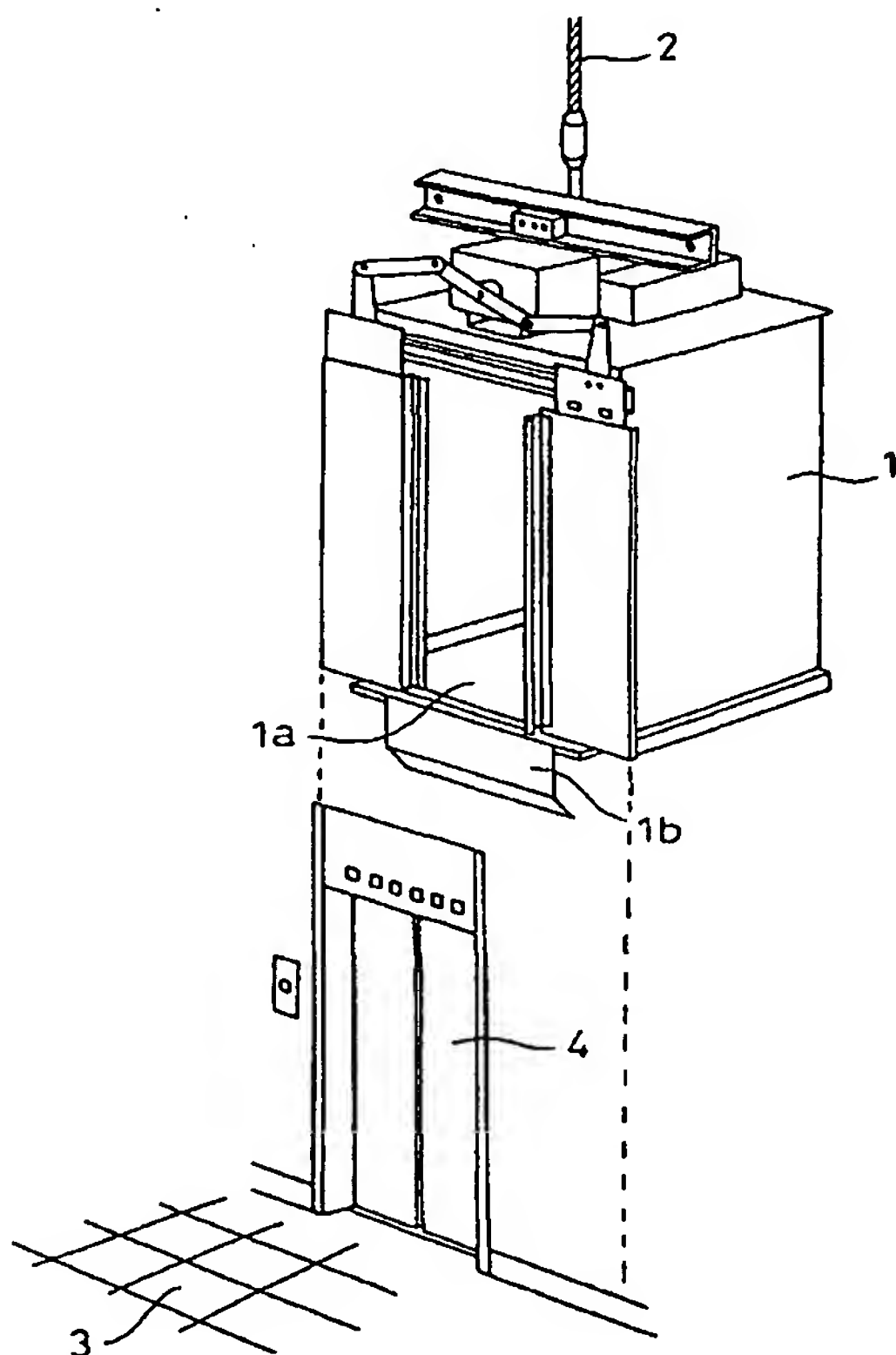
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[Continued on next page]

(54) Title: **MOVEABLE TOE GUARD ASSEMBLY FOR ELEVATORS**



(57) Abstract: An elevator toe guard (7) has a fixed portion (7a) and a sliding portion (7b) that will move upwardly in response to contact with the floor (13a) of the pit (13) of an elevator hoistway thereby to avoid being damaged by contact with the floor. A toe guard (15) has a fixed portion (15a) and a rotatable portion (15b) that is held against rotating by locking levers (21a, 21b) unless the elevator is sufficiently close to the floor (13a) of the hoistway pit (13) so that release brackets (22) will move the locking levers, permitting the rotatable portion (15b) to rotate in response to contact with the floor of the pit, thereby to avoid being damaged by contact with the floor.

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## Moveable Toe Guard Assembly for Elevators

### Technical Field

This invention relates to an elevator toe guard assembly that will not be damaged even when the depth of the pit at the lowest floor is less than the standard depth.

### Background Art

In Fig. 1, an elevator car 1 moves up and down within an elevator hoistway (not shown), suspended by a cable 2. A doorway having a door 4, through which passengers board and exit the car 1, is formed between the hallway of each floor 3 and the hoistway. As the car 1 descends, if the door 4 opens after the bottom plate 1a of car 1 has reached the same height as the floor 3, there will be no problem; but door 4 may start to open before bottom plate 1a and floor 3 are aligned; in such a case, the feet of passengers may come between car 1 and floor 3. Therefore, a toe guard 1b (also called a platform guard or apron) is furnished to prevent that from happening.

However, since the toe guard is fixed to the car, if the hoistway pit is shallow, when the car reaches the floor position at the lowest floor, the toe guard will strike the floor of the pit and be damaged.

### Disclosure of Invention

Objects of this invention include an elevator toe guard assembly that will not be damaged if it strikes the floor of a hoistway pit.

According to the invention, an elevator toe guard assembly, which projects downward from the bottom, front side of an elevator

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car, includes a contracting means to reduce the height of said toe guard when said car descends into the elevator pit. According further to the invention, said toe guard telescopes so that it will contract when it is pushed upward by the floor of the pit. In accordance further with the invention, said toe guard is rotated upwardly under the elevator by the floor of the pit when a rotation-restricting means contacts a releasing means in the hoistway pit.

Other objects, features and advantages of the present invention will become more apparent in the light of the following detailed description of exemplary embodiments thereof, as illustrated in the accompanying drawing.

#### Brief Description of the Drawings

Fig. 1 is a partial, perspective view of an elevator having a conventional toe guard.

Fig. 2 is a partial, front elevation view of a sliding embodiment of the invention.

Fig. 3 is a partial, side elevation view of the embodiment of Fig. 2.

Fig. 4 is a partial, front elevation view of a rotating embodiment of the present invention.

Fig. 5 is a partial, side elevation view of the embodiment of Fig. 4.

#### Mode(s) for Carrying Out the Invention

The embodiment of Figs. 1 and 2 telescopes vertically, so that part of it will rise upwardly in response to force resulting from contact of the toe guard with the floor 13a of the hoistway pit 13.

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In Fig. 1, toe guard 7 includes a fixed plate 7a and a moveable plate 7b, furnished on the floor side 12 of bottom plate 6 of the car 1. The upper part of fixed plate 7a is joined to bottom plate 6 by screws, not shown. The lower part of fixed plate 7a is supported by a pair of reinforcements 8 having one end fixed to the underside of bottom plate 6, and the other end fixed to the lower part of fixed plate 7a. A guide member 9 is fixed to each side of fixed plate 7a. The guide members 9 are L-shaped in cross section, when cut parallel to the horizontal plane (looking downward). Each end of moveable plate 7b is inserted between fixed plate 7a and the related guide member 9, which confine the moveable plate 7b while allowing it to slide upwardly. The pair of reinforcements 8 are inserted into a pair of slots 10 in moveable plate 7b so that the movement of moveable plate 7b is not hindered by the reinforcements 8. A lip 11 formed at the top edge of moveable plate 7b prevents the moveable plate 7b from falling downwardly. The bottom edge is bent at an appropriate angle toward the inside, as required by some government regulatory codes.

Under normal circumstances, moveable plate 7b hangs down due to its own weight, and is stopped by the lip 11 touching the guide members 9. In this position, toe guard 7 provides its intended function of preventing feet from being pinched between floor 12 and bottom plate 6. In the unlikely event that the depth of pit 13 is less than a standard value, moveable plate 7b is pressed upward by floor 13a and moves upwardly relative to fixed plate 7a, whereby toe guard 7 contracts. For this reason, damage to the toe guard 7 caused by striking floor 13a is prevented.

In the embodiment of Figs. 4 and 5, part of the toe guard rotates upwardly when upward force is applied by the pit floor. A

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toe guard 15 includes a fixed plate 15a and rotatable plate 15b, disposed on the boarding hall side 12 of floor plate 6. The upper edge of fixed plate 15a is fastened to floor plate 6, such as by screws (not shown). The rotatable plate 15b is disposed to rotate around a pair of pivot shafts 16 disposed within bushings 17 formed at both ends of fixed plate 15a, and bushings 18 formed at both ends of the upper edge of rotatable plate 15b. Counterclockwise rotation (as seen in Fig. 5) of rotatable plate 15b around pivot shaft 16 is stopped by the upper edge of rotatable plate 15b touching the lower edge of fixed plate 15a, with fixed plate 15a and plate 15b forming a single plane. At the same time, clockwise rotation is blocked by a pair of locking levers 21a, 21b. A pair of posts 19, project downward from floor plate 6 at both sides of toe guard 15. A horizontal pivot shaft 20, projecting toward floor 12, is capable of rotating within the bottom of each post 19, and locking levers 21a, 21b are attached to each pivot shaft 20. A pair of springs (not shown for clarity), force locking lever 21a counterclockwise and locking lever 21b clockwise (as seen in Fig. 4), while a stop (not shown for clarity) is furnished to stop the locking levers 21 from turning beyond horizontal in response to the spring force.

Normally, locking levers 21a, 21b will be in the horizontal state, as indicated in Fig. 4, to block rotating plate 15b from turning. A pair of L-shaped release brackets 22 disposed on the floor side 12 of pit 13 rotate the restriction levers 21a, 21b when the bottom plate 6 drops below a certain position in the pit 13. The bottom ends of the release brackets 22 are fixed to the pit floor 13a, and the top ends are fixed to the side wall of the pit 13.

Under normal conditions, rotatable plate 15b hangs down due to its own weight, the locking levers 21a, 21b are horizontal, and

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rotatable plate 15b will not pivot from the position at point C in Fig. 5 to the position at point D. For this reason, rotatable plate 15 performs its intended function. In the rare event that the depth of pit 13 is less than the standard value, the outside ends of the locking levers 21a, 21b are pressed upward by the release brackets 22 which turns the locking levers 21 from horizontal to nearly vertical, and the restriction on turn plate 15b is released. For example, the left end of locking lever 21b (Fig. 4) is rotated from being near point A to being near point B. Thereafter, if the bottom end of rotatable plate 15b touches the floor 13a, horizontal force is applied to the end of the slanted lower part of rotatable plate 15b which moves from near point C (Fig. 5) to near point D. Therefore, damage caused to the toe guard 15 by striking the floor 13a is prevented.

On the other hand, when bottom plate 6 rises again along with the car, release bracket 22 separates from the locking levers 21a, 21b which then return to the horizontal position due to the force of the springs (not shown) and the rotatable plate 15b returns to a state where it performs its intended function.

With the elevator toe guard assembly of the invention, the height of the toe guard becomes smaller when the bottom end of the toe guard touches the floor of the pit. Thus, even in the rare event that the depth of the pit is less than the standard value, the toe guard will not be squeezed between the pit floor and the car, and damage to the toe guard will thus be prevented.

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### Claims

1. A toe guard (1b, 7, 15) for an elevator car (1) moveable within a hoistway which has a pit (13) with a floor (13a), said toe guard extending downwardly from the bottom surface (6) of the elevator car, beneath the door thereof;  
characterized by the improvement comprising:  
at least a portion (7b, 15b) of said toe guard being moveable in response to contact with the floor of the pit, thereby to avoid being damaged.
2. A toe guard according to claim 1 wherein said portion slides upwardly in response to contacting the floor of the pit.
3. A toe guard according to claim 1 wherein said portion is rotatable about at least one pivot shaft (16); and further comprising:  
at least one locking lever (21a, 21b) disposed to prevent rotation of said portion when said locking lever is in a first position;  
and  
a release bracket (22) disposed near the bottom of the pit to move said locking lever from said first position to a second position in which said portion can rotate in response to contact with the floor of the pit.



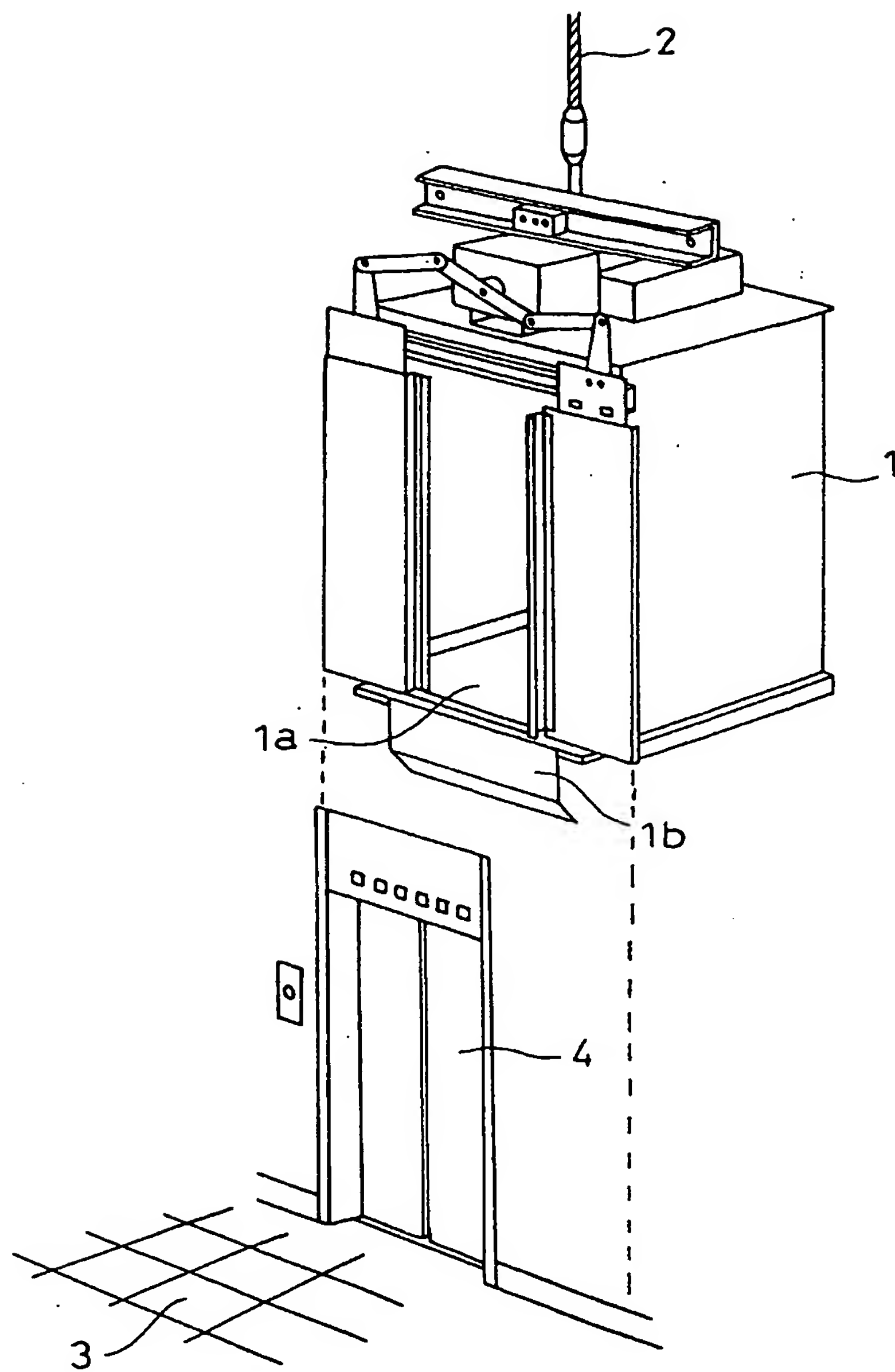


FIG. 1

PRIOR ART

FIG. 2

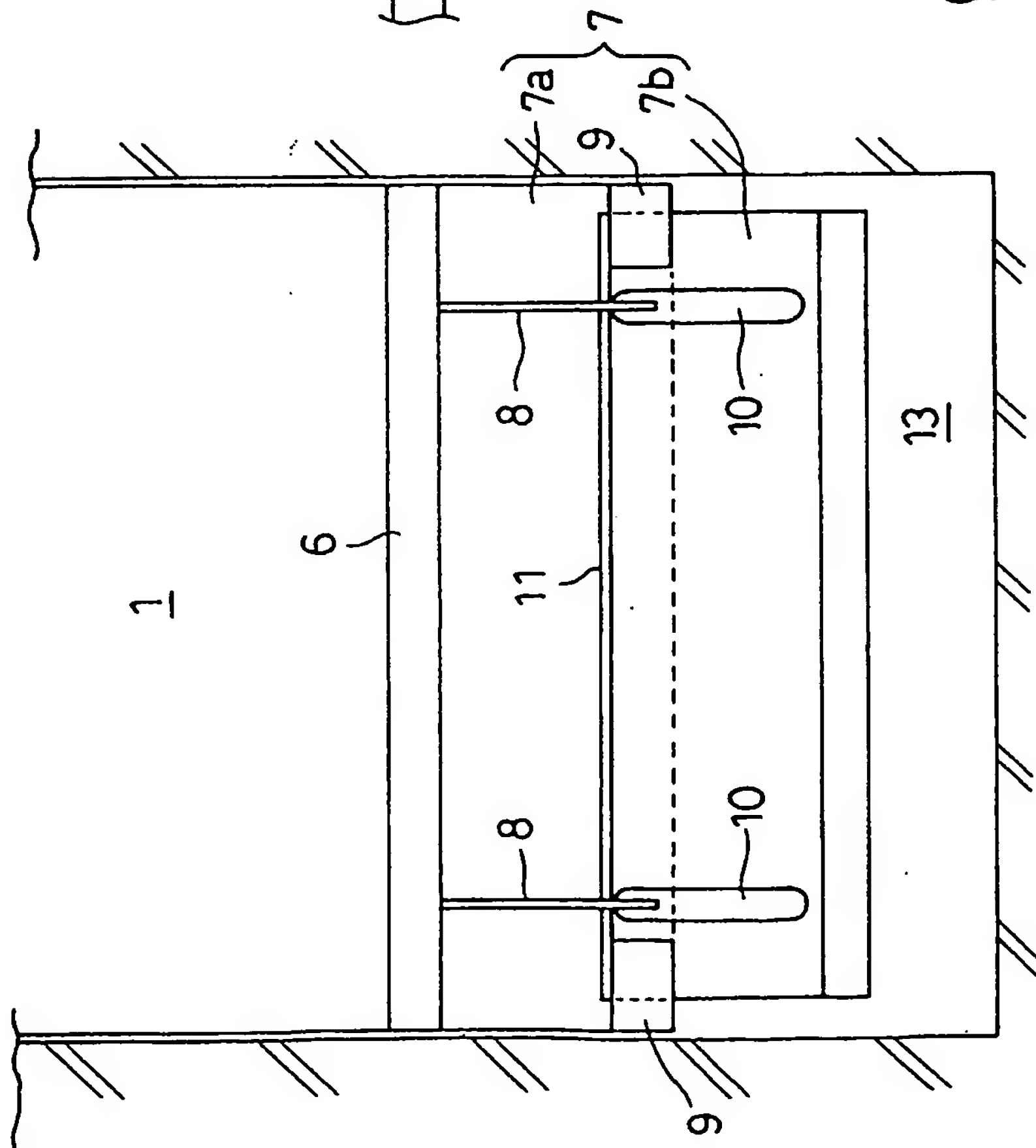


FIG. 3

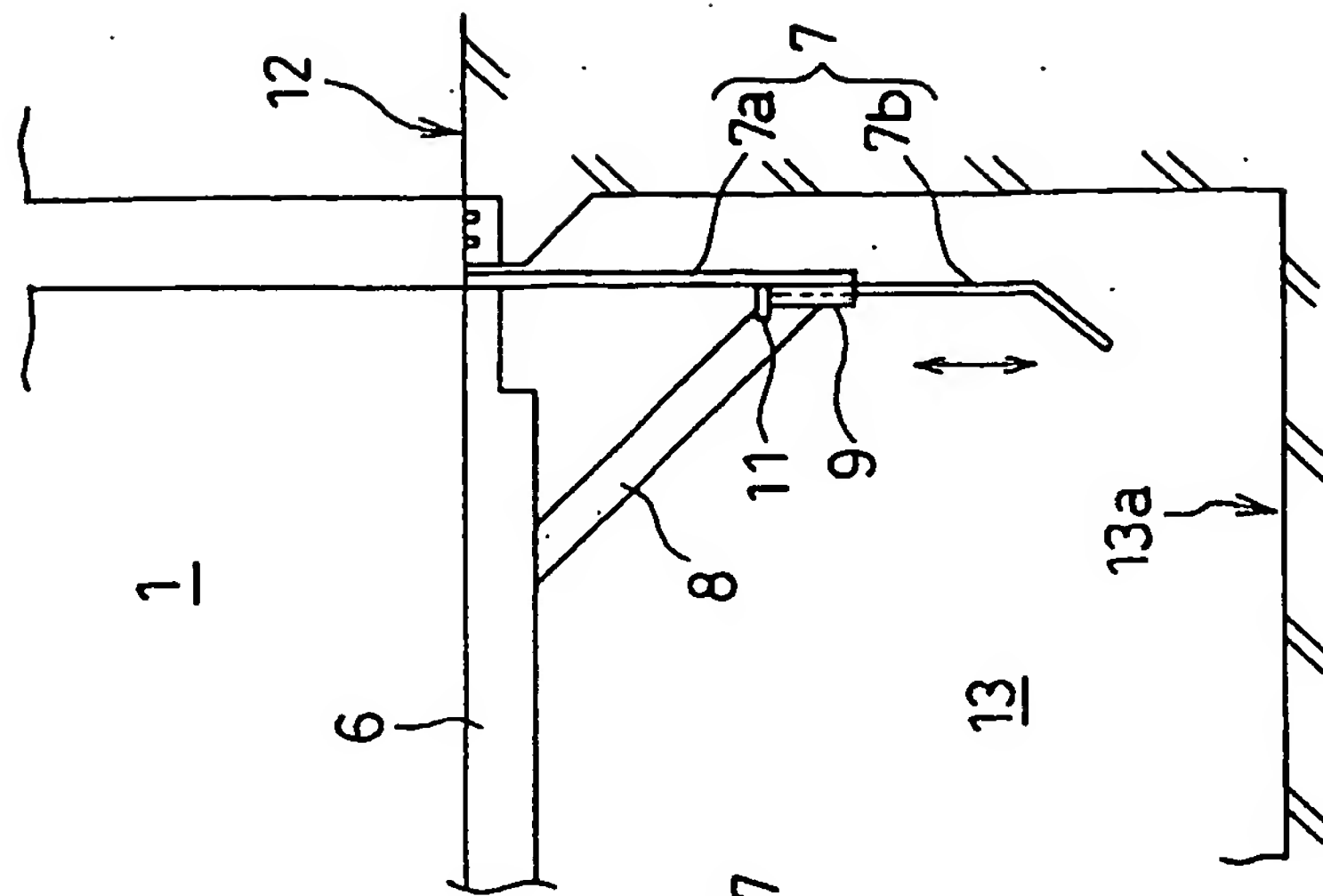


FIG. 4

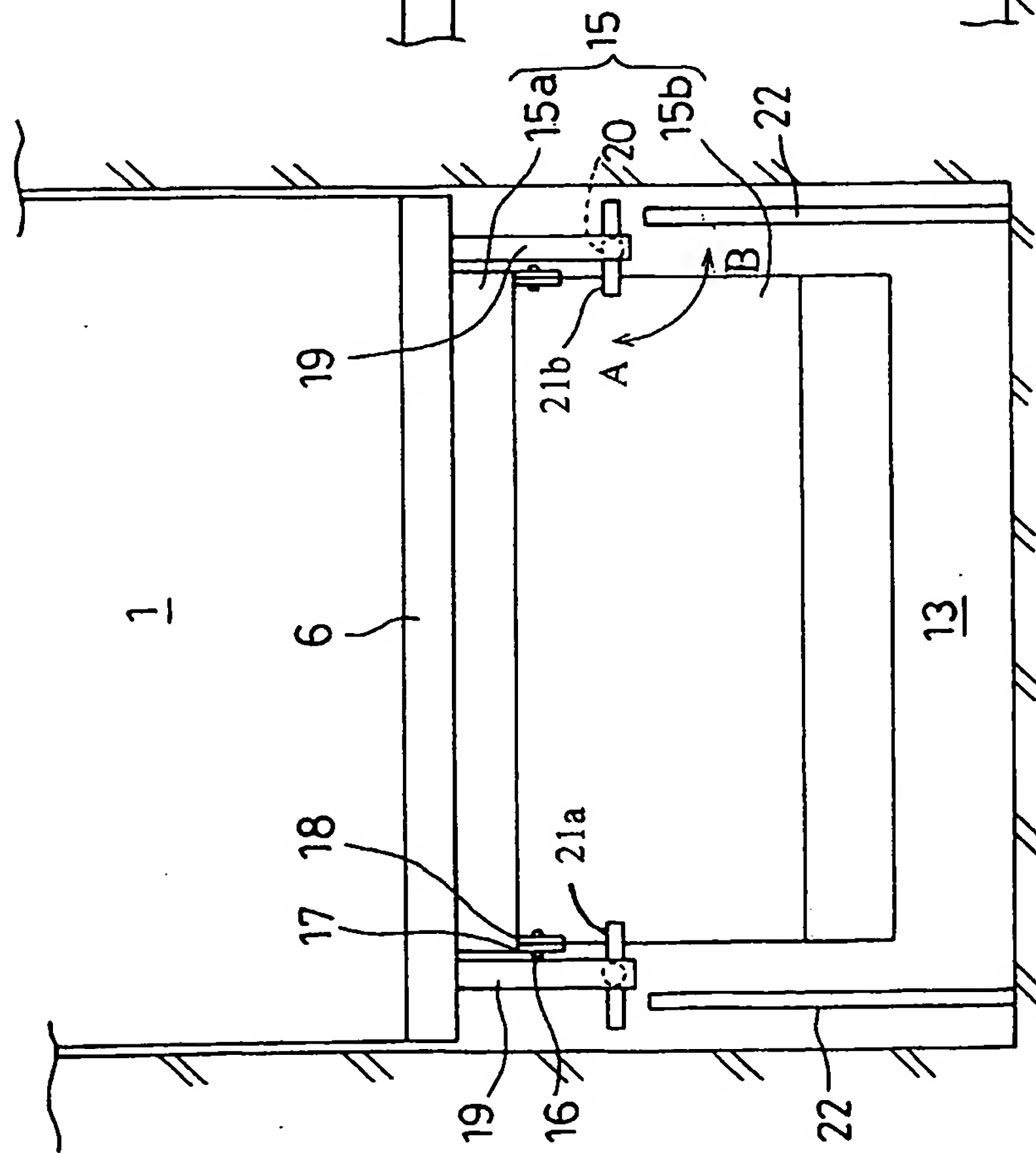
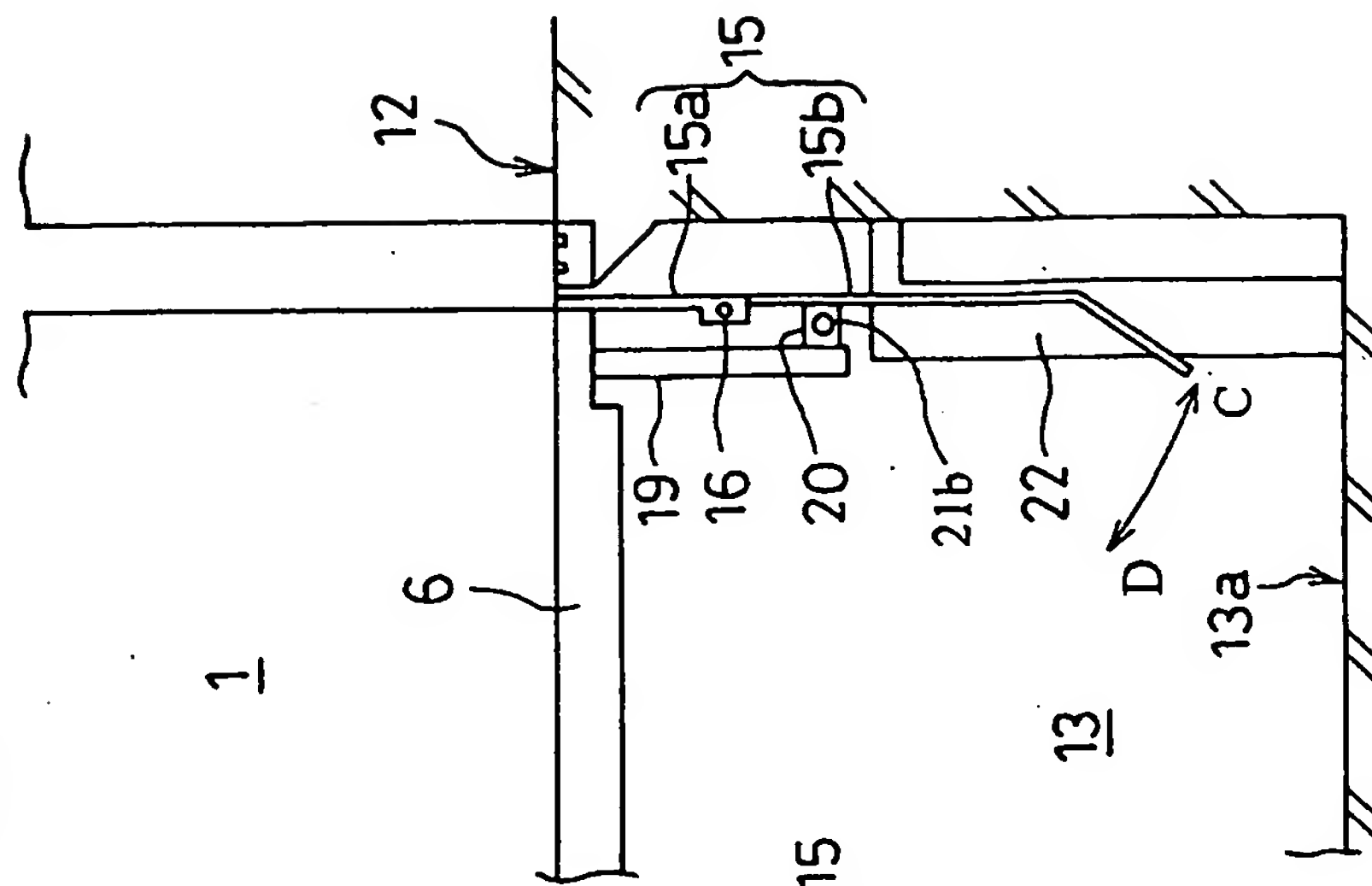


FIG. 5



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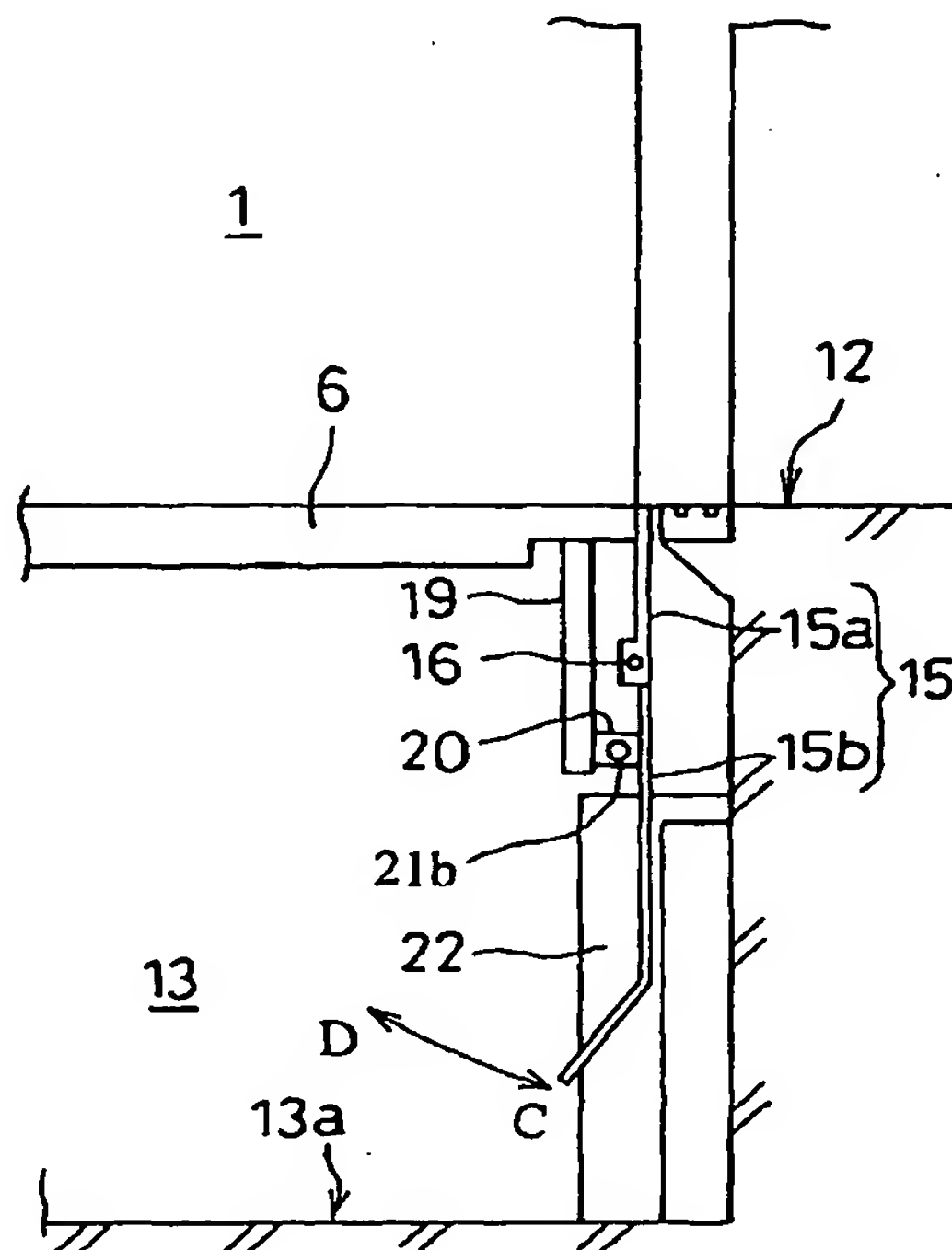
(75) Inventors/Applicants (*for US only*): **MORI, Jyunichiro** [JP/JP]; #307, 3-5-10, Higashiikuta, Tama-ku, Kawasaki-shi, Kanagawa 214-0031 (JP). **HONGO, Masaharu** [JP/JP]; #205, 271-1 Tamachi, Narita-shi, Chiba 286-0024 (JP).

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## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CH 431 864 A (INVENTIO AG) 15 March 1967 (1967-03-15)	1, 3
Y	column 3, line 12 - line 48; figures	2
Y	JP 60 102386 A (HITACHI LTD; HITACHI ELEVATOR & SERVICE) 6 June 1985 (1985-06-06)	2
A	figure 7	1
P, X	EP 1 118 576 A (THYSSEN AUFZUGSWERKE GMBH) 25 July 2001 (2001-07-25) column 2, line 27 - line 35; figures	1-3
E	WO 02 10053 A (GIORGIONI PAOLO ; SELCOM SPA (IT)) 7 February 2002 (2002-02-07) the whole document	1-3

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Information on patent family members

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